Equilibria of Molten Pig Iron of the System Fe-C-Si and Slag of the System SiO-CaO-AlO uuder One Atmospheric Pressure of Carbon Monoxide

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17. Equilibria of Molten Pig Iron of the System Fe-C-Si and Slag of the System SiO_2-CaO-Al_2O_3 uuder One Atmospheric Pressure of Carbon Monoxide

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In case of the production of pig iron in blast furnace or electric furnace, the equilibrium of molten pig iron and slag is an important problem. Therefore, we determined at 1400℃, 1500℃ and 1600℃ the equilibria of molten pig iron of the system Fe-C-Si and slag of the system SiO_2-CaO-Al_2O_3 under one atmospheric pressrre of carbon monoxide.

The carbon monoxide gas was produced by dehydrating formic acid by hot conc. sulphuric acid and introduced at about one atmospheric pressure into a hard porcelain reaction tube after it was purified.

High carbon pure white pig iron, synthetic slag of the system SiO_2-CaO-Al_2O_3 containing 10% Al_2O_3, and metallic silicon were melted together in a graphite crucible, which was placed in the reaction tube, and the melt was kept at a definite temperature. The graphite crucible containing the melt was taken out from the reaction tube as quickly as possible, and was quenched in water. Temperature was measured by both the optical pyrometer and the Pt-PtRh pyrometer.

We determined first the time required for the attainment of equilibrium.

Then we determined the equilibrium relation between the composition of the pig and the basicity of slag. It was found that the time required for the attainment of equilibrium was 2 hrs. 30 min. at 1400℃ and 2 hrs. at 1500℃ and 1600℃ in the first experiments. Therefore we kept the melting time for 3 hrs. at every temperature in the second experiments and the following results were obtained:

Temperature	Pig		Slag			
	C%	Si%	SiO_2%	CaO%	Al_2O_3%	Basicity
1400℃	3.78	3.55	58.9	31.5	9.28	0.53
	4.28	1.87	46.5	41.0	9.70	0.88
	4.52	1.36	44.3	46.5	8.71	1.05
1500℃	3.57	5.67	68.7	20.2	10.34	0.29
	3.71	4.68	57.7	31.8	9.39	0.55
	4.20	2.93	46.1	43.0	9.46	0.93
	4.36	2.21	38.4	50.4	9.42	1.31
1600℃	3.84	6.42	65.5	24.8	9.62	0.38
	4.17	4.47	51.0	38.8	10.13	0.76
	4.60	2.93	42.2	47.6	9.55	1.13
	4.41	2.64	38.5	51.2	9.92	1.13

From these results we found that (1) at a constant temperature, the C contents of the pig iron increase and the Si contents decrease, as the basicity of the slag becomes higher, (2) when the basicity of the slag is constant, the Si content of the pig iron increases as temperature becomes higher and the C content of the pig iron is almost independent of temperature.

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18. On the Continuous Leaching

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In wet metallurgy, the small quantity of soluble metal salt present in raw material is leached continuously by thickener or drag belt in some cases. In such cases, several formulae can be introduced. The salt concentration of leaching solution or washing solution and leaching efficiency can be determined by these formulae in which variables are the quantity of raw material treated, the quantity of solution in leaching tank or washing tank, the content of soluble metal salt in raw material, the content of solution in leached residue after leaching or washing, the quantity of supplied solution to leaching tank or washing tank and the method of circulation of solution. These formulae were applied to some cases of continuous leaching of copper from pyrite cinder.

Following results were obtained.

1. When leaching tank alone or a series of one leaching tank and one washing tank were used, salt concentration of solution and leaching efficiency approached infinitely a limiting value in the course of time. This limiting value was determined by the content of soluble metal salt in raw material and the content of solution in leached residue after leaching or washing. In these cases, increasing rate of salt concentration of solution and decreasing rate of leaching efficiency decreased when capacity of tanks increased.

2. When a leaching tank, a washing tank and a recovering tank were operated simultaneously, salt concentration of solution and leaching fficiency were determined by the content of soluble metal salt in raw material, the content of solution in leached residue after leaching or washing and the quantity of solution which was let to flow from leaching tank to recovering tank.